

WHAT IS CLAIMED IS:

1. A magnetic memory comprising:

first and second wirings intersecting each other
and positioned apart from each other;

5 a magnetoresistance effect film positioned between
the first and second wirings and comprising

a magnetic recording layer configured to
reverse a magnetization direction thereof by changing a
direction of a magnetic field, which is generated by
10 passing writing currents through the first and second
wirings, between a first direction and a second
direction different from the first direction,

a magnetization pinned layer configured to
hold the magnetization direction thereof when the
15 direction of the magnetic field is changed between the
first direction and the second direction, and

a nonmagnetic layer intervening between the
magnetic recording layer and the magnetization pinned
layer; and

20 a first magnetic film comprising

a first portion facing the magnetoresistance
effect film with the first wiring interposed
therebetween and

25 a pair of second portions positioned on both
sides of the first wiring and magnetically connected to
the first portion, each of the first and second
portions comprising either one of a high saturation

magnetization soft magnetic material containing cobalt and a metal-nonmetal nano-granular film.

2. The memory according to claim 1, further comprising a second magnetic film which comprises
5 a third portion facing the magnetoresistance effect film with the second wiring interposed therebetween and

10 a pair of fourth portions positioned on both sides of the second wiring and magnetically connected to the third portion, each of the third and fourth portions comprising either one of a high saturation magnetization soft magnetic material containing cobalt and a metal-nonmetal nano-granular film.

15 3. The memory according to claim 1, wherein the magnetic recording layer is positioned between the second portions.

20 4. The memory according to claim 1, wherein a length of the first magnetic film along a longitudinal direction of the first wiring is 1.2 times or more a length of the magnetoresistance effect film along the longitudinal direction of the first wiring.

25 5. The memory according to claim 1, wherein the first magnetic film comprises a high permeable magnetic material as the high saturation magnetization soft magnetic material, the high permeable magnetic material is an alloy containing cobalt or cobalt-iron as a main component, and the first and second wirings contain one

material selected from the group consisting of copper, tungsten, and an alloy of copper and tungsten.

6. The memory according to claim 1, wherein the first magnetic film comprises a high permeable magnetic material or cobalt-iron as the high saturation magnetization soft magnetic material, the high permeable magnetic material is an alloy containing cobalt or cobalt-iron as a main component, and each of the first and second wirings has a multilayered structure including a nonmagnetic layer and a high saturation magnetization soft magnetic material layer.

7. The memory according to claim 1, wherein the first magnetic film comprises at least one film selected from the group consisting of a Co-Fe alloy film, a Co-Fe-Ni alloy film, a Co-(Zr, Hf, Nb, Ta, Ti) film, an amorphous film of these films, and a metal-nonmetal nano-granular film.

8. The memory according to claim 1, wherein the nonmagnetic layer is a nonmagnetic tunnel layer.

9. The memory according to claim 1, further comprising a sense current control element configured to control a sense current to be passed through the magnetic memory.

10. A magnetic memory comprising:
25 first and second wirings intersecting each other and positioned apart from each other;
a magnetoresistance effect film positioned between

the first and second wirings and comprising
a magnetic recording layer configured to
reverse a magnetization direction thereof by changing a
direction of a magnetic field, which is generated by
5 passing writing currents through the first and second
wirings, between a first direction and a second
direction different from the first direction,
first and second magnetization pinned layers
sandwiching the magnetic recording layer and each
10 configured to hold a magnetization direction thereof
when the direction of the magnetic field is changed
between the first direction and the second direction,
a first nonmagnetic layer intervening between
the first magnetization pinned layer and the magnetic
15 recording layer, and
a second nonmagnetic layer intervening
between the second magnetization pinned layer and the
magnetic recording layer; and
a first magnetic film comprising
20 a first portion facing the magnetoresistance
effect film with the first wiring interposed
therebetween and
a pair of second portions positioned on both
sides of the first wiring and magnetically connected to
25 the first portion, each of the first and second
portions comprising either one of a high saturation
magnetization soft magnetic material containing cobalt

and a metal-nonmetal nano-granular film.

11. The memory according to claim 10, wherein the second portions are in contact with one of the first and second nonmagnetic layers which is closer to the 5 first magnetic film than the other of the first and second nonmagnetic layers.

12. The memory according to claim 10, further comprising a second magnetic film which comprises 10 a third portion facing the magnetoresistance effect film with the second wiring interposed therebetween and

15 a pair of fourth portions positioned on both sides of the second wiring and magnetically connected to the third portion, each of the third and fourth portions comprising either one of a high saturation magnetization soft magnetic material containing cobalt and a metal-nonmetal nano-granular film.

20 13. The memory according to claim 10, wherein the magnetic recording layer is positioned between the second portions.

25 14. The memory according to claim 10, wherein a length of the first magnetic film along a longitudinal direction of the first wiring is 1.2 times or more a length of the magnetoresistance effect film along the longitudinal direction of the first wiring.

15. The memory according to claim 10, wherein the first magnetic film comprises a high permeable magnetic

material as the high saturation magnetization soft magnetic material, the high permeable magnetic material is an alloy containing cobalt or cobalt-iron as a main component, and the first and second wirings contain one material selected from the group consisting of copper, tungsten, and an alloy of copper and tungsten.

16. The memory according to claim 10, wherein the first magnetic film comprises a high permeable magnetic material or cobalt-iron as the high saturation magnetization soft magnetic material, the high permeable magnetic material containing cobalt or cobalt-iron as a main component, and each of the first and second wirings has a multilayered structure including a nonmagnetic layer and a high saturation magnetization soft magnetic material layer.

17. The memory according to claim 10, wherein the first magnetic film comprises at least one film selected from the group consisting of a Co-Fe alloy film, a Co-Fe-Ni alloy film, a Co-(Zr, Hf, Nb, Ta, Ti) film, an amorphous film of these films, and a metal-nonmetal nano-granular film.

20 18. The memory according to claim 10, wherein the nonmagnetic layer is a nonmagnetic tunnel layer.

25 19. The memory according to claim 10, further comprising a sense current control element configured to control a sense current to be passed through the magnetic memory.

20. A magnetic memory comprising:

first and second wirings intersecting each other
and positioned apart from each other;
a magnetoresistance effect film positioned between
5 the first and second wirings and comprising
a magnetic recording layer configured to
reverse a magnetization direction thereof by changing a
direction of a magnetic field, which is generated by
passing writing currents through the first and second
10 wirings, between a first direction and a second
direction different from the first direction,

first and second magnetization pinned layers
sandwiching the magnetic recording layer and each
configured to hold a magnetization direction thereof
15 when the direction of the magnetic field is changed
between the first direction and the second direction,

a first nonmagnetic layer intervening between
the first magnetization pinned layer and the magnetic
recording layer, and

20 a second nonmagnetic layer intervening
between the second magnetization pinned layer and the
magnetic recording layer; and

a first magnetic film comprising

25 a first portion facing the magnetoresistance
effect film with the first wiring interposed
therebetween and

a pair of second portions positioned on both

sides of the first wiring and magnetically connected to the first portion, the second portions being in contact with one of the first and second nonmagnetic layers which is closer to the first magnetic film than the other of the first and second nonmagnetic layers.

5 21. A magnetic memory comprising:

first and second wirings intersecting each other and positioned apart from each other; a magnetoresistance effect film positioned between the first and second wirings and comprising

10 a magnetic recording layer configured to reverse a magnetization direction thereof by changing a direction of a magnetic field, which is generated by passing writing currents through the first and second wirings, between a first direction and a second direction different from the first direction,

15 first and second magnetization pinned layers sandwiching the magnetic recording layer and each configured to hold a magnetization direction thereof when the direction of the magnetic field is changed between the first direction and the second direction,

20 a first nonmagnetic layer intervening between the first magnetization pinned layer and the magnetic recording layer, and

25 a second nonmagnetic layer intervening between the second magnetization pinned layer and the magnetic recording layer; and

a first magnetic film comprising
a first portion facing the magnetoresistance
effect film with the first wiring interposed
therebetween and

5 a pair of second portions positioned on both
sides of the first wiring and magnetically connected to
the first portion, the magnetic recording layer being
positioned between the second portions.